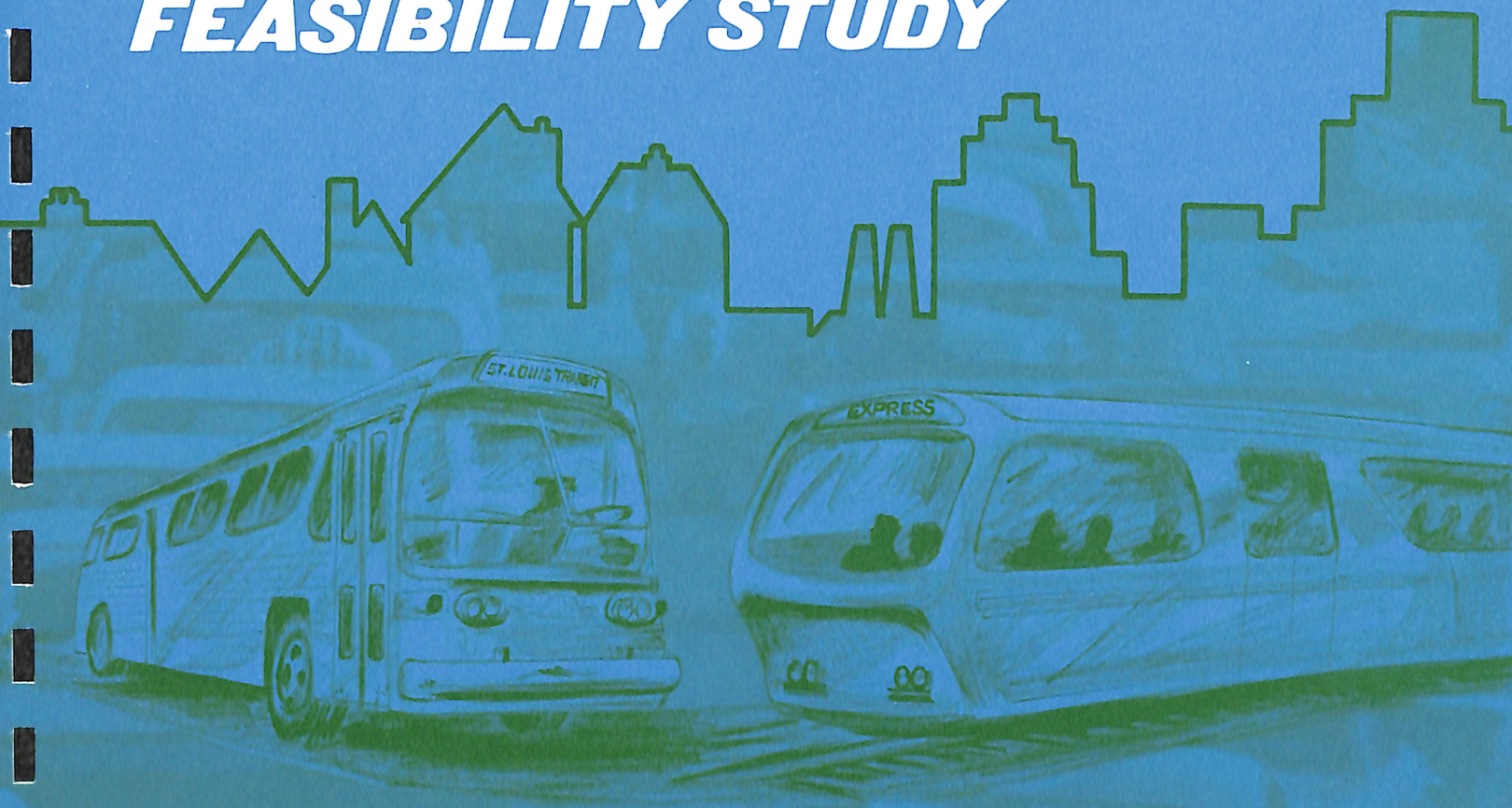
ST. LOUIS METROPOLITAN AREA RAPID TRANSIT FEASIBILITY STUDY



SUMMARY REPORT
ALTERNATIVE TRANSIT SYSTEMS

EAST-WEST GATEWAY
COORDINATING COUNCIL

BI-STATE DEVELOPMENT AGENCY
MISSOURI-ILLINOIS
METROPOLITAN DISTRICT

PARSONS BRINCKERHOFF • TUDOR • BECHTEL • SVERDRUP & PARCEL
SAN FRANCISCO ST. LOUIS NEW YORK

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San Francisco St. Louis New York

JULY, 1969

EAST-WEST GATEWAY COORDINATING COUNCIL
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PHONE 274-2750
AREA CODE 618

July 7, 1969

TO CITIZENS OF THE METROPOLITAN AREA:

This report summarizes alternative transit systems for the Greater St. Louis Metropolitan Area. The alternative systems were developed as a part of a technical study of "how to move large groups of people - quickly, comfortably, safely and economically."

Engineering recommendations, however, are not the only considerations which will lead to the best transportation facilities for this area. Social, economic, and intergovernmental factors must also be weighed.

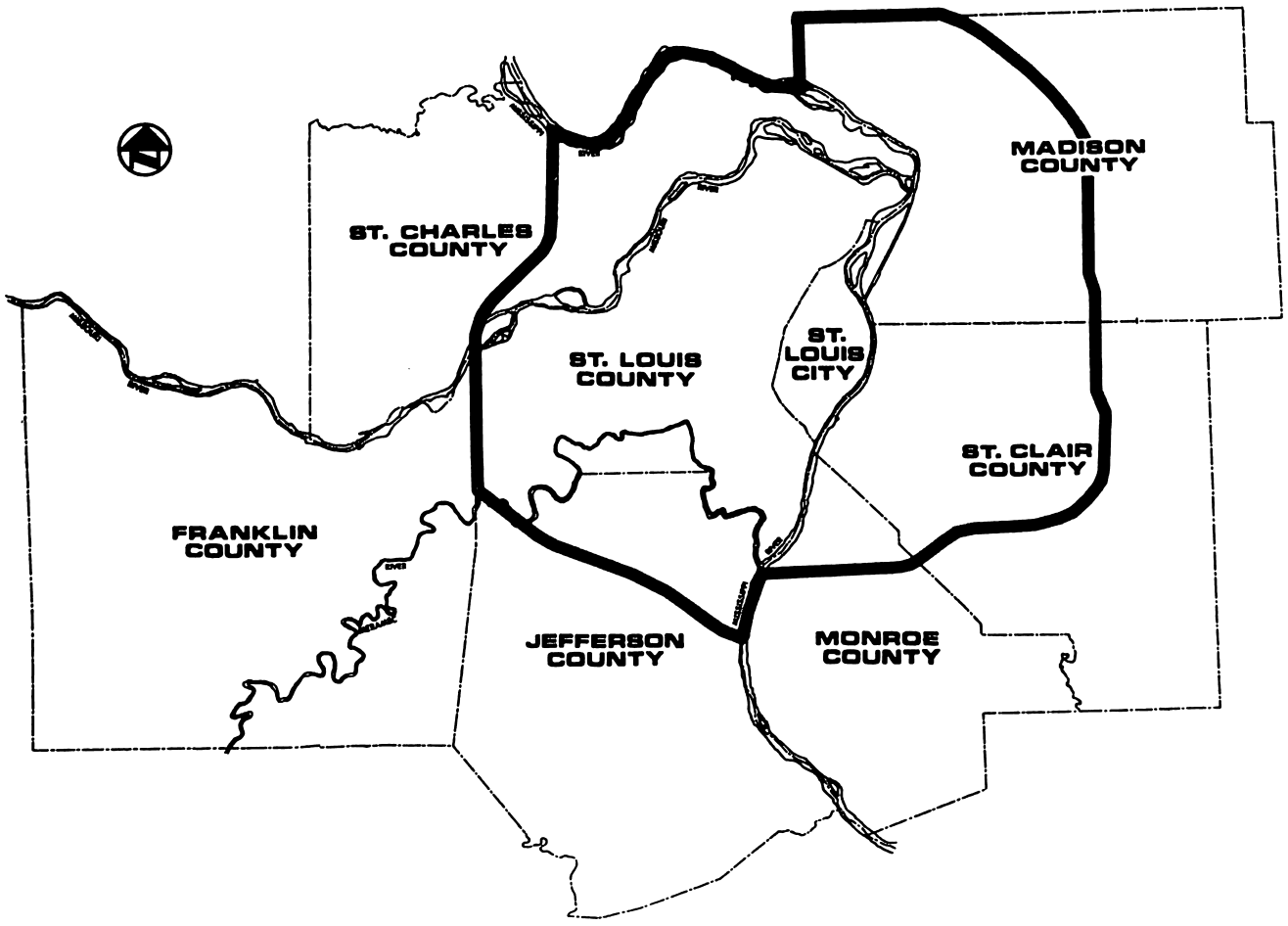
The public will have many questions regarding any transit proposal, including financing, routes, fares, convenience and safety. Attitudes of employers and employees, users and non-users, minority groups, and others must be evaluated.

As the representative of the local governments of this area the Gateway Council must perform a primary role in securing answers to these and other questions. It must provide the leadership in securing a final community decision on rapid transit.

Alvin G. Fields

Alvin G. Fields, Sr., Chairman
East-West Gateway Coordinating Council

EAST-WEST GATEWAY COORDINATING COUNCIL
STUDY AREA
With
CORDON LINE



REGIONAL LOCATION

INTRODUCTION

The summary report is an abstract of an Interim Report which is the second in a series of reports prepared as part of the cooperative Bi-State Development Agency - East-West Gateway Coordinating Council program to determine the feasibility of rapid transit for the St. Louis Metropolitan area. The first report, entitled "Analysis of Existing Transit System" was completed in November, 1968 and included an analysis of, and a description of, the present transit system. The continuing effort following the completion of the Interim Report will lead ultimately to a final report in which a long range system and a recommended Initial Project will be established.

The determination of a rapid transit system best suited to the St. Louis Metropolitan area involves comparison and evaluation of a number of possible alternative systems. The alternative systems to be considered offer varying degrees of attraction for prospective transit users, and the potential patronage will be increased or decreased depending upon the degree of attraction. Patronage also determines operating costs and revenues and the physical extent of a system which, in turn, determines the initial capital cost requirement. The final selection of a transit system, therefore, involves a balancing of service to be provided , versus cost of installation.

The purpose of the Interim Report is to identify these alternative systems so that a decision can be made as to which ones justify further development in the Phase III program. During Phase III, those alternatives which are selected will be studied in depth to determine the long range public transportation system needed in the St. Louis Metropolitan area.

FUTURE GROWTH

Like many other metropolitan centers, the St. Louis area is experiencing a change in the character of its economy. The city itself is expected to extend its decline in population, which started about twenty years ago, but will level off at about 600,000 persons between 1975 and 1990. Its number of job opportunities, however, is expected to increase by some 26 percent with a higher rate of growth in the non-manufacturing, or service, segment of the economy. In contrast, the study area (see map on inside cover) is expected to enjoy an increase in population of about 40 percent to about 3.1 million persons in 1990 and job opportunities are expected to increase by about 70 percent to reach 1.5 million. It is also expected that the trend in locating employment centers in the suburban portions of the metropolitan area will continue.

PUBLIC TRANSPORTATION SYSTEM POLICIES

It is generally agreed that every urban region requires both the use of the private automobile and public transportation. The proper systems, however, are a matter for each region to determine since each area's existing systems, public preferences, and daily needs are different.

In addition to the normal policies applicable to public transportation systems, the following are suggested as being specifically applicable to the St. Louis Metropolitan area:

(1) A rapid transit system would provide regional instead of only urban service.

(2) Aerial structures would not be comtemplated in central business districts.

(3) To assure maximum safety and reliability of schedules, the rapid transit system would be operated under automatic control, wherever practicable.

(4) Service would be provided at minimum headways in the peak periods in areas where lines converge and at a maximum of ten minutes during the midday off-peak periods. On evenings and weekends, service would be scheduled to meet demand. Rapid transit service would not be provided between the hours of 1:00 a.m. and 5:00 a.m. to allow for servicing and maintaining equipment.

(5) The rapid transit system would be capable of maintaining an average speed of 30 to 45 mph including station stops. The exact speed will depend on the distance between stations.

TRANSIT CORRIDORS

The urban character of the St. Louis Metropolitan area was strongly influenced by transportation systems and the development they stimulated. The original corridors adopted for pioneer trails were used by the omnibus and streetcar and are used today by the bus and automobile. These main corridors are known today as Natural Bridge, Gravois, and Highway 40. In addition, almost all of the major highways presently converge on the

St. Louis Central Business District (CBD). The greatest concentrations of travel, therefore, are in radial directions with the CBD as the hub. Circumferential travel, however, has become increasingly important. The general locations of the existing transit corridors are shown in Figure 1.

TRAVEL PROJECTIONS

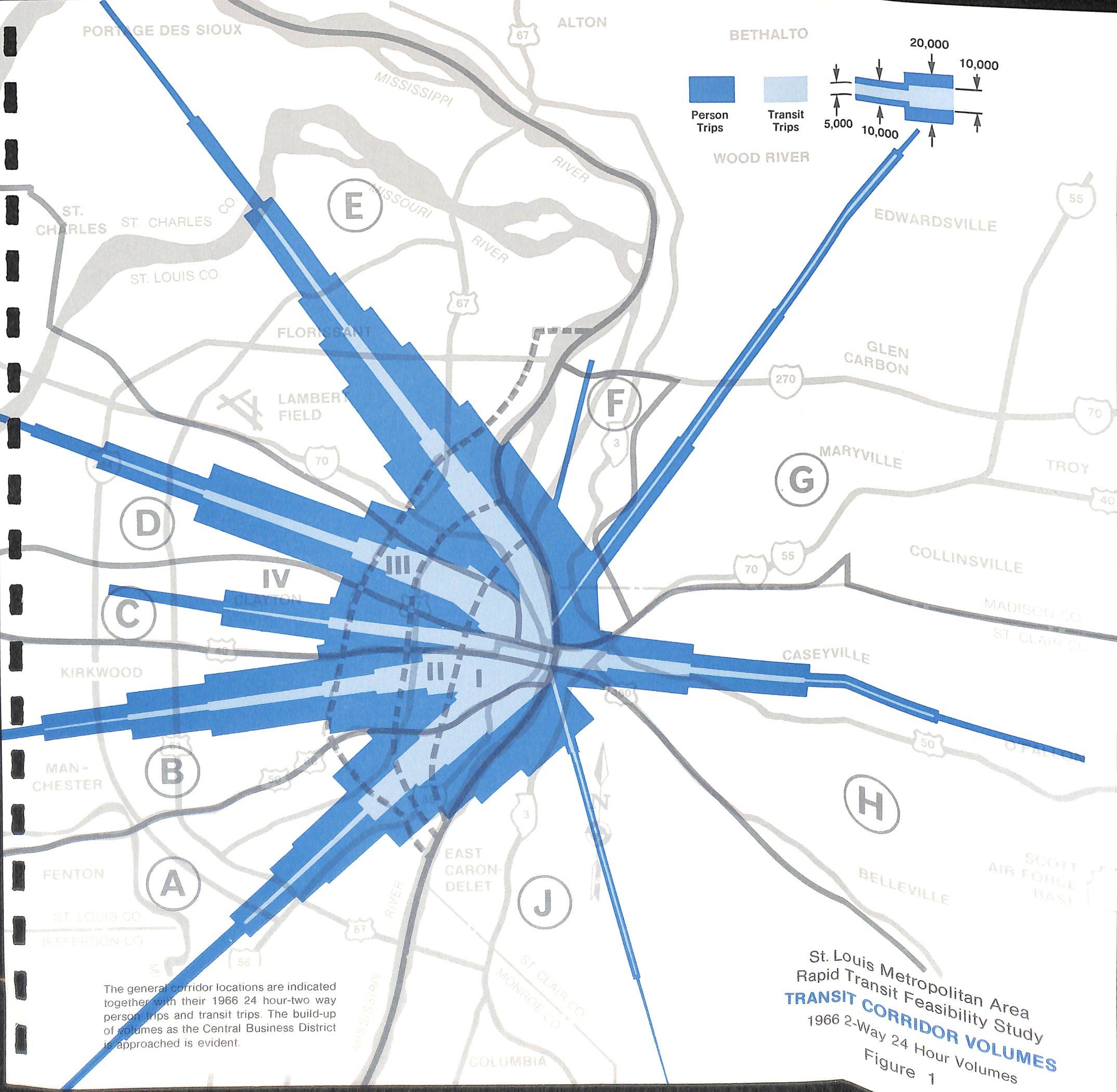
Although complete travel projections for the target year (1990) are not available at this time, an interim procedure has been used for estimating the 1990 transit volumes. This procedure is based on the assumptions that:

(1) CBD growth in employment will strongly influence future transit volumes.

(2) An improved transit system operating on an exclusive grade-separated right-of-way will create an increase in patronage.

(3) An increase in transit patronage will also take place which will be proportional to the amount of vehicle congestion in a corridor and, by 1990, will range from 10 percent to 20 percent of CBD oriented non-transit trips.

Based on these assumptions, Corridor A (Gravois), extending in a Southwesterly direction from the CBD, has the highest projected peak hour peak direction volume of 7,300; Corridor E (Natural Bridge), extending in a northwesterly direction from the CBD, is the next most important corridor having a projected peak hour peak direction volume of 6,400.



The general corridor locations are indicated together with their 1966 24 hour-two way person trips and transit trips. The build-up of volumes as the Central Business District is approached is evident.

St. Louis Metropolitan Area
Rapid Transit Feasibility Study

TRANSIT CORRIDOR VOLUMES

1966 2-Way 24 Hour Volumes

Figure 1

The third most important is Corridor B (Highway 40), extending in a westerly direction from the CBD with a projected peak hour peak direction volume of 4,400. The most important corridor on the Illinois side of the river is Corridor H, extending in a southeasterly direction from East St. Louis toward Belleville, and it has a projected peak hour peak direction volume of 2,500.

ALTERNATIVE TRANSIT SYSTEM

The alternative transit systems considered in this report are composed of different mixes of buses utilizing existing streets, highways or freeways; rapid transit systems of various forms; and/or commuter railroad service.

All of the alternative systems considered include the bus as an integral part of the system but in varying degrees of importance and extent. The role of an adequate and an efficient bus system in the St. Louis Metropolitan area is an important one today and, in all probability, will continue to be, regardless of any new system that might be adopted.

Buses Traveling on the Public Highways

This system requires the use of buses on existing and future streets and highways. Because of the inherent flexibility of the bus - it can operate wherever there is a street or highway - there are many variations possible in such a system. The basic component, however, is an extensive network

of local and express buses reaching into the residential areas and providing service to the CBD as well as to other focal points.

Since the only public transportation system in the St. Louis Metropolitan area is provided by buses, it is apparent that the least costly alternative, in terms of capital costs, is an all-bus system that is essentially an extension of today's system routed to utilize the assumed 1990 highway network as much as possible. This alternative then presents a plane of reference, or base, to which all other alternative systems can be compared.

Rail Rapid Transit

Rail rapid transit consists of electric powered trains supported on steel wheels operating on steel rails. Such systems have had many years of successful operation in the United States, Canada and abroad. Currently, new systems of this type are either being designed or are under construction in San Francisco; Washington, D.C.; and Caracas, Venezuela.

The principal advantage of rail rapid transit is its capacity to accommodate large volumes of people through a heavily traveled corridor at high speed with safety and a high degree of regularity.

Rail rapid transit is well adapted to automatic train control because of the unmatched simplicity and reliability of rail switches. The principal advantages of automatic control are a capability to safely maintain close headways at high speed, complete control of all trains at all times and a reduction in operating cost due to the minimum use of labor.

Since all current versions of rail rapid transit are propelled by electric propulsion systems that do mot emit noxious fumes or gases, this system will not contribute pollutants to the atmosphere.

The major disadvantages of rail rapid transit are its inherent rigidity and its relatively high cost for initial installation. A special guideway or track must always be available and once this is constructed it cannot be moved to meet changes in demand except at great cost. A capital expenditure is required, therefore, if expansion in a transit system's service is required.

Bus Rapid Transit

While no public transit system fulfills the ideal goal of providing complete door-to-door service, it can be more nearly achieved with buses than with any other system. In current transporta-

tion technology, only the bus has the unique capability of operating on public streets and highways as well as on private rights-of-way.

If an area-wide bus system were provided with an exclusive, fully grade-separated busway in "corridors" where transit demand is high, buses could gather their passengers in the neighborhoods they serve, enter the busway for the high speed, non-stop portion of their journey, then return to city streets to distribute passengers at or near their destinations. A single vehicle, therefore, can be utilized to provide both feeder-collector service and trunk line service, thus eliminating the need for transferring.

One of the disadvantages of the bus is that it operates in mixed traffic while performing the feeder type service and thus is subject to the normal traffic delays. Experience has shown that delays account for 15-20 percent of the total trip time. Another disadvantage is that buses, whether operating on or off a busway are subject to delays caused by inclement weather.

Still another disadvantage is that each bus must have an operator. This results in a high operator-to-passenger ratio which significantly

increases the cost of operation. Since the operator must be used to steer and guide the vehicle, the advantages of automatic operation with respect to adherence to schedules, close headways in peak periods, assurance of passenger safety and low operating costs, are not possible.

The effect of some of these disadvantages can be reduced by the use of exclusive bus lanes, exclusive bus streets, and/or special on-off ramps from freeways.

In connection with a busway operation, it should be pointed out that no extensive "busways", particularly those operating on aerial structures or in underground structures, have been built in this country - not even in the median strip of freeways.

Commuter Rail

Commuter railroads offer the possibility of high speed, high capacity rail service, and low new capital investment by utilizing facilities already in existence.

The use of commuter rail presupposes the availability of existing railroad trackage in areas of highest transit demand and a willingness on the part of the railroads to permit commuter

operations in common with their normal freight operations.

From the point of view of sufficient patronage potential, three lines of the entire railway network in the St. Louis area are reasonably well located to bring some relief in traffic congestion, or to provide significantly improved mobility for those who do not have automobiles. Two of these lines are operated by the Norfolk and Western Railway Company which has indicated that it is impossible to accommodate commuter trains on their tracks. The third is owned by the Missouri Pacific Railroad Company which has indicated that commuter service could be accommodated during the morning and evening peak hours but not during the off-peak hours.

The Missouri Pacific Railroad Company has also indicated that it would not undertake the operation of a commuter service. Consequently, this would have to be undertaken by some form of public agency.

It should also be noted that, because of the inherent high costs of railroad operation, almost nowhere in the United States does commuter railroad service recover operating costs.

The railroad network within the study area is shown in Figure 2.

OTHER TECHNOLOGY

Over the past several years a great variety of new concepts have been advanced for urban transportation. Proponents of new systems range from individual inventors to large industrial firms. Stages of development range from promotional brochures to fully operable demonstration and commercial facilities. Qualifications of the groups involved extend from amateur to completely professional.

A review of the "state of the art" of transit system technology was made from the standpoint of the following criteria:

1. The system must be operational by 1975.
2. The system must have a line capacity of 5,000 to 10,000 passengers per hour per lane or track.
3. The system must provide average speeds of 30 to 45 miles per hour including station stops.
4. The system must be able to operate in tunnels, at grade, or on elevated structures.
5. The system must be suitable for urban transportation operation.

Based on this review, those systems that were found to be unacceptable for the St. Louis area were eliminated from further consideration. A further screening of those that remained indicated that future consideration could be given to such concepts as the Transit Expressway,

tracked air cushion vehicles, and the bi-modal bus if the state of the art justifies it at the time that the transit system for the St. Louis area is actually being designed.

SYSTEMS TO BE COMPARED AND ANALYZED

The purpose of a public transportation systems study is to determine through a process of comparison, evaluation and elimination which of the alternative systems are most suitable for the St. Louis Metropolitan area. Each system has its advantages and disadvantages in terms of potential patronage, capital costs, operating costs, potential revenues, and impact on the region. These are the factors that must be weighed.

Buses on the Public Highways

At the outset it is apparent that one system to be evaluated is the present transit facilities expanded to include the assumed 1990 highway network shown on Figure 3. Such a system would involve the least capital outlay and would present a plane of reference to which other systems can be compared.

Rapid Transit

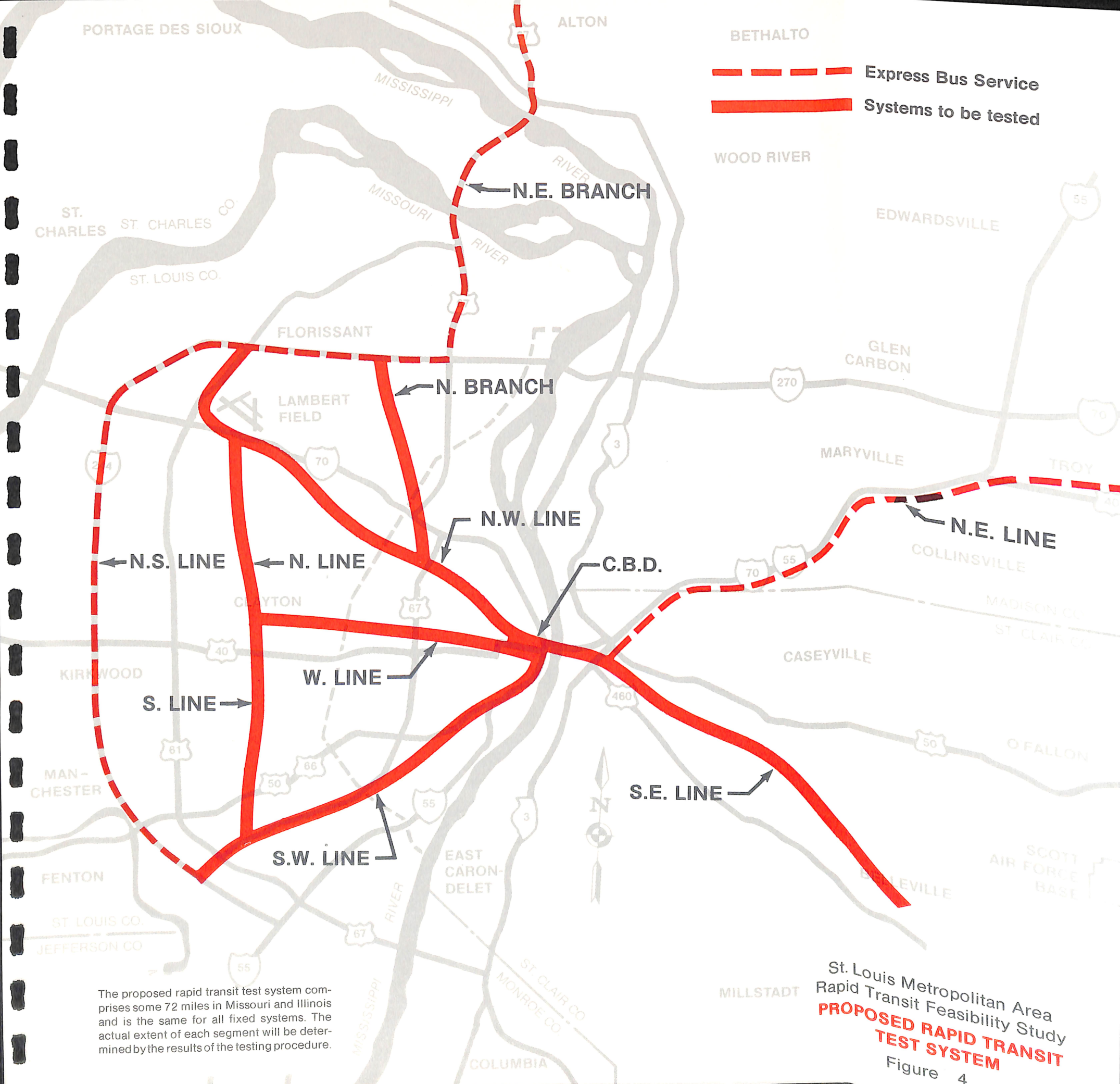
Other systems which warrant evaluation consist of grade separated facilities operating on private rights-of-way. For evaluation purposes

the type of vehicle that operates over the facility is of lesser importance than the location of the route and this should be such as to meet the development objectives of the urban area it is intended to serve. For this reason it is deemed best to restrict the systems evaluated to those whose characteristics are either already reliably known or which represent only a reasonable advancement from present levels. These would consist of the modern transit bus operating on a "busway" and the modern rapid transit car operating with steel wheels on steel rails. The locations of the rapid transit systems proposed for evaluation are shown on Figures 4, 5, and 6. In all cases they would tie in with an extensive bus network operating on the public highways. A link is visualized between St. Louis and East St. Louis via the Eads Bridge as well as a main terminal and maintenance facility in East St. Louis with underground routings in the central business districts of St. Louis, East St. Louis and Clayton.

ORDER OF MAGNITUDE COSTS OF CONSTRUCTION

Buses on the Common Highways

The primary costs involved in this alternative are in the additional costs of equipment, if needed.

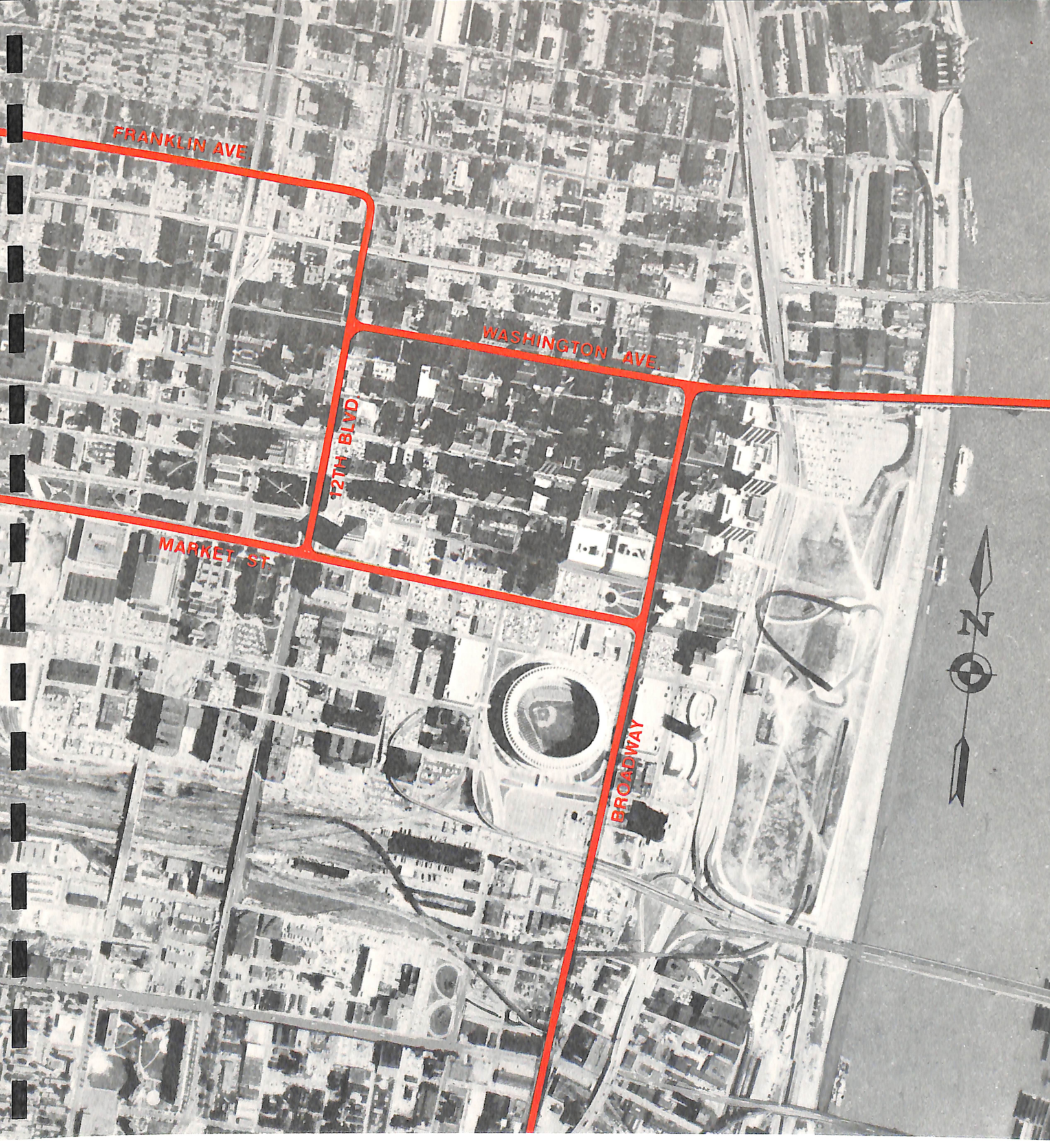


The proposed rapid transit test system comprises some 72 miles in Missouri and Illinois and is the same for all fixed systems. The actual extent of each segment will be determined by the results of the testing procedure.

St. Louis Metropolitan Area
Rapid Transit Feasibility Study

PROPOSED RAPID TRANSIT TEST SYSTEM

Figure 4

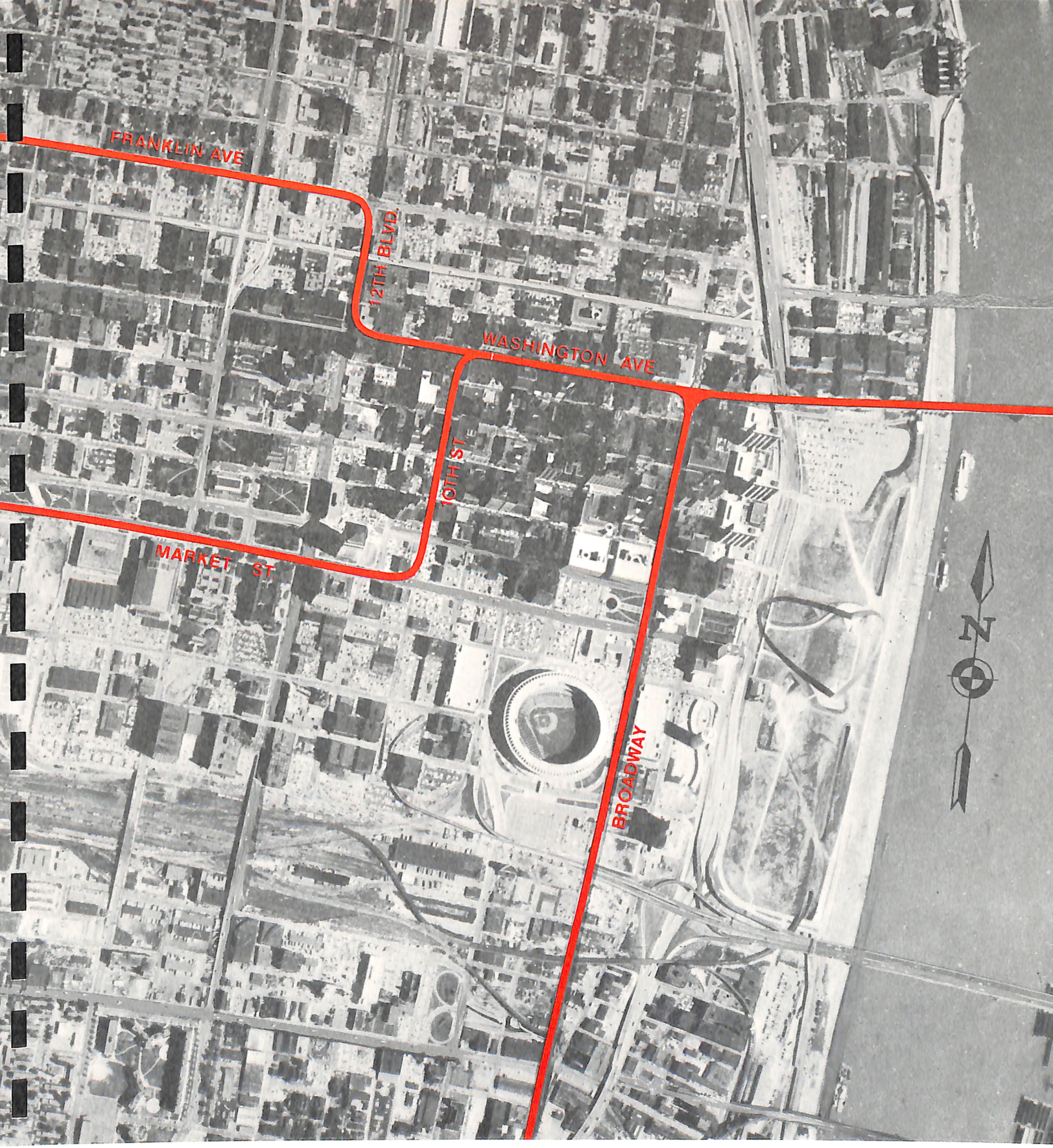


The proposed underground Busway distribution system in the St. Louis CBD would be located in Broadway, Washington Avenue, 12th Boulevard and Market Street with a station located on each leg of the loop.

St. Louis Metropolitan Area
Rapid Transit Feasibility Study

CBD DISTRIBUTION SYSTEM (BUSWAY)

Figure 5



The proposed underground Rail Transit distribution systems in the St. Louis CBD would be located in Broadway, Washington Avenue, and 10th Street. Single level stations are located in Broadway and 10th Street while a double level station is located in Washington Avenue.

St. Louis Metropolitan Area
Rapid Transit Feasibility Study

CBD DISTRIBUTION SYSTEM (RAIL TRANSIT)

Figure 6

Rapid Transit Systems

Preliminary assignments of costs and types of construction have been prepared for the rapid transit systems suggested for evaluation even though the extent of any one line or, in fact, the actual inclusion of any line or lines can only be determined during the evaluation procedure to be accomplished in Phase III of this study.

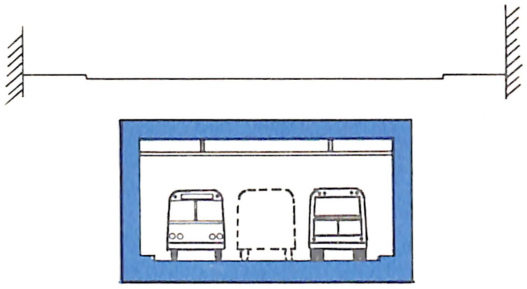
As an aid in comparing two systems, however, the estimated cost for various combinations of lines, (shown in Figures 4, 5, and 6) including right-of-way, but excluding the cost of rolling stock and provision for inflation, have been developed and are shown below. These costs are based on average costs of similar facilities as experienced in other areas and adjusted for construction in the St. Louis area. These costs are set forth simply as broad indications of the order of magnitude costs of construction of the alternative rapid transit systems, and in no event should they be considered as a basis for financing.

EXAMPLES OF POTENTIAL CONSTRUCTION COSTS FOR EVALUATION, MAY 1, 1969

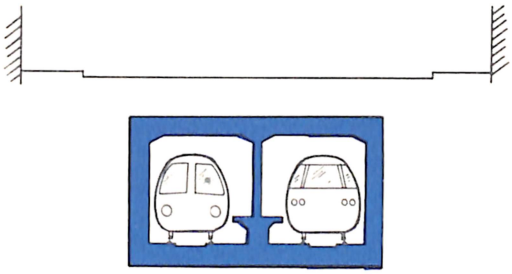
Example System Description	Potential Length in Miles	Potential Costs * (Millions of Dollars)	
		Busway	Rail Transit
1. Northwest, Southeast and CBD (Lambert Field through St. Louis and East St. Louis to Belleville)	32	250-300	375-425
2. Southeast, West and CBD (Belleville through East St. Louis and St. Louis to Clayton)	24	250-300	350-400
3. Southwest, Northwest, Southeast and CBD (Sunset Hills through St. Louis to Lambert Field, and St. Louis through East St. Louis to Belleville)	47	450-500	575-625
4. Southwest, Northwest, and CBD (Sunset Hills through St. Louis to Lambert Field)	35	400-450	475-525

* (Not to be added. These figures only represent examples.)

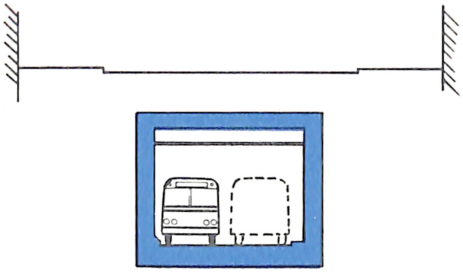
There are many possible combinations and those selected do not represent systems or stages of construction. They are presented merely as illustrations. The typical types of construction are shown on Figure 7.



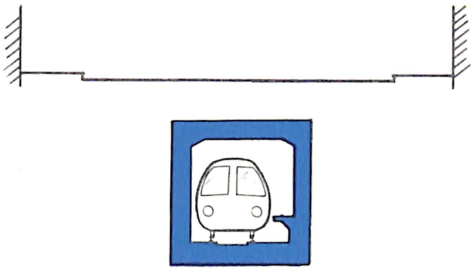
TWO LANE UNDERGROUND STRUCTURE



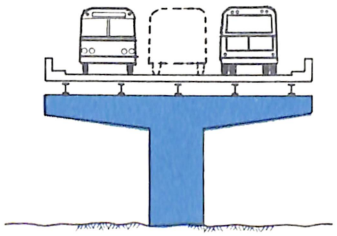
UNDERGROUND STRUCTURE



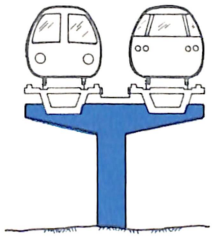
ONE LANE UNDERGROUND STRUCTURE



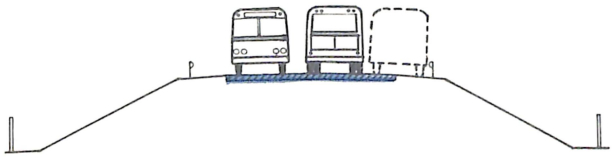
UNDERGROUND STRUCTURE



TWO LANE AERIAL STRUCTURE

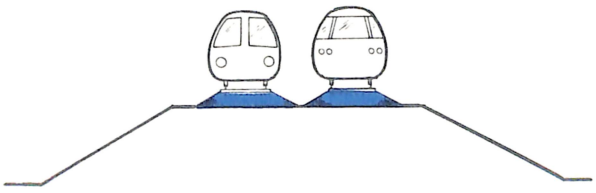


AERIAL STRUCTURE



TWO LANE EMBANKMENT SECTION

BUSWAYS



EMBANKMENT SECTION

RAIL TRANSIT

St. Louis Metropolitan Area
Rapid Transit Feasibility Study

TYPICAL RAPID TRANSIT CROSS SECTIONS

Figure 7

FINANCING

Financing of a large scale capital improvement program such as a rapid transit system requires careful, detailed study and close cooperation with the financial and political leadership in the community. Experience in other large metropolitan areas in the United States indicates that this is a formidable obstacle to be overcome in implementing a comprehensive public transportation system.

The operating revenues in the foreseeable future cannot be relied upon to yield any substantial margin above operating costs. Any financial plan, therefore, should provide for the payment of debt service on the cost of fixed construction and of an initial fleet of rolling stock from some form of public support.

The methods for financing mass transportation development in other areas are all related to each community's financial resources, its outstanding indebtedness - both present and anticipated - and other local characteristics. An "ad valorem" real estate tax in the areas served by the system has also been used as well as a state wide luxury tax. Consideration has been given to a levy on vehicle valuation, an increase in the "business and occupation" tax, and a general obligation bond issue backed by the full faith and credit of the municipality.

The Federal government fosters the development of improved transportation facilities and there appears to be a tendency toward even greater Federal participation and

support. It seems advisable, however, to assume that the local community would have to bear a large part of the cost of financing a system and any future Federal assistance that should be authorized, is very likely to require substantial local matching participation.

ORGANIZATION OF A TRANSPORTATION AUTHORITY

The most feasible method of coordinating transit operation in any region is under the aegis of a Regional Transportation Authority. Such an authority should have powers to make studies, raise funds through various means, and act in the public interest in all matters concerning both today's transit services and a future system of transportation. The Bi-State Development Agency has already been granted many of the powers that are necessary to make it an effective Transportation Authority. To be fully viable, however, the Bi-State Development Agency must have the right to raise money above and beyond funds available through passenger revenue.

PORTAGE DES SIOUX
ALTON
BETHALTO
MISSISSIPPI
RIVER
WOOD RIVER
MISSOURI
RIVER
ST. CHARLES
ST. CHARLES CO.
ST. LOUIS CO.
EDWARDSVILLE
FLORISSANT
GLEN CARBON
LAMBERT FIELD
MARYVILLE
TROY
COLLINSVILLE
MADISON CO
ST. CLAIR CO
CLAYTON
KIRKWOOD
CASEYVILLE
O'FALLON
MAN-CHESTER
FENTON
EAST CARONDELET
SCOTT AIR FORCE BASE
BELLEVILLE
MILLSTADT
COLUMBIA
MONROE CO
N
N & W RR
C-R I & P RR
T RR
N & W RR
Mo Pac RR
St L-S F RR

Existing Railroads

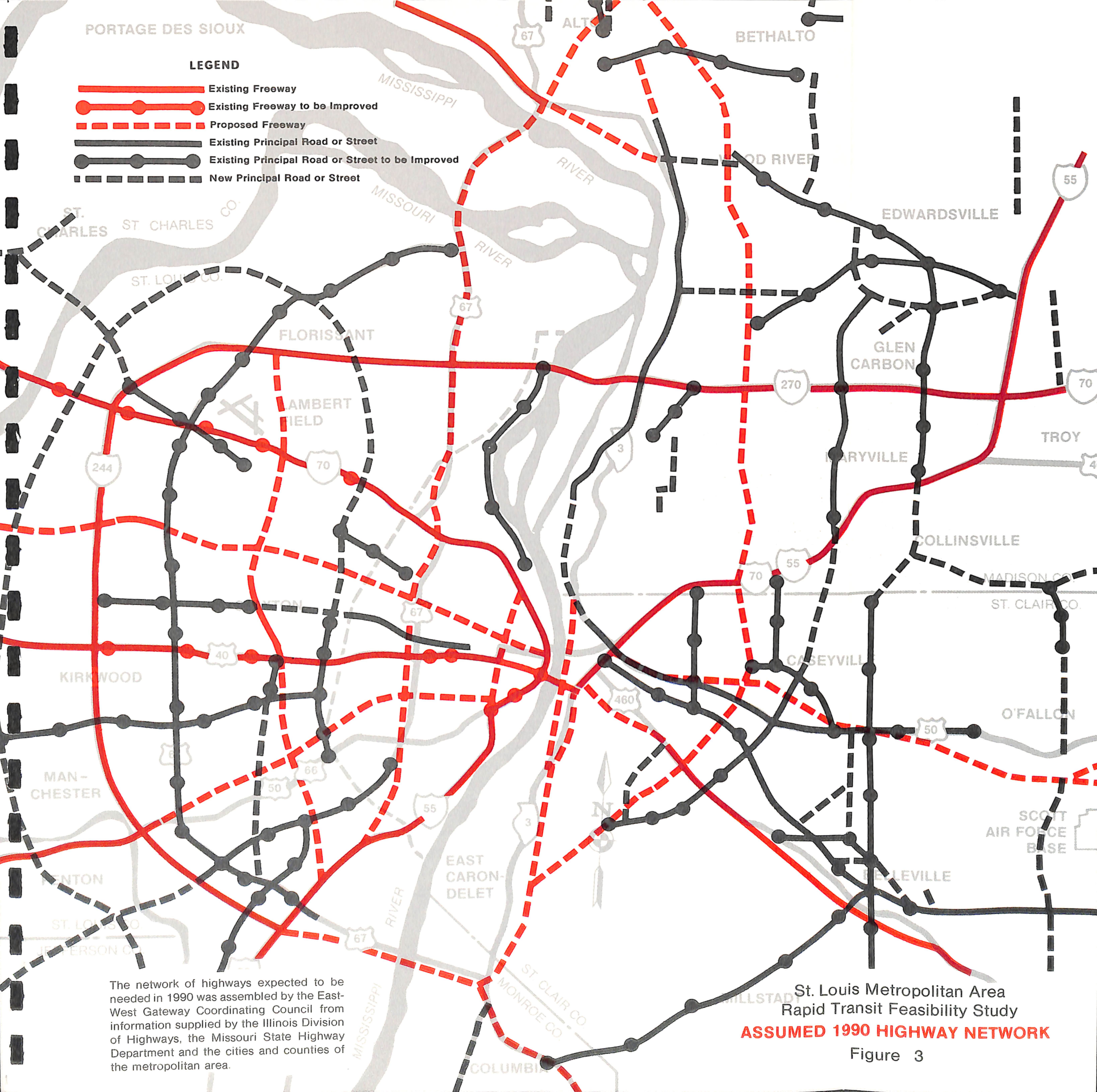
Existing Railroads Studied.

Of the total railroad network in the St. Louis Metropolitan Area, it was found that only three lines would generate sufficient commuter travel to warrant study. Of these three, two would operate over the tracks of the Norfolk and Western Railway Company and would interfere with railroad operations. The third line, over the Missouri Pacific or St. Louis, San Francisco tracks, is the only one that warrants further study.

St. Louis Metropolitan Area
Rapid Transit Feasibility Study

PRESENT RAILROAD NETWORK

Figure 2



The network of highways expected to be needed in 1990 was assembled by the East-West Gateway Coordinating Council from information supplied by the Illinois Division of Highways, the Missouri State Highway Department and the cities and counties of the metropolitan area.

St. Louis Metropolitan Area
Rapid Transit Feasibility Study
ASSUMED 1990 HIGHWAY NETWORK
Figure 3